

# NEWS REPORT

NATIONAL ACADEMY OF SCIENCES  
NATIONAL RESEARCH COUNCIL



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## CONTENTS

### FEATURE ARTICLE

#### The Earth Satellite Program

*Joseph Kaplan and Hugh Odishaw* ..... 1

SCIENCE NEWS ..... 3

COOPERATING SOCIETIES ..... 11

RECORD OF MEETINGS ..... 14

NEW PUBLICATIONS ..... 15

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# NEWS REPORT

National Academy of Sciences      National Research Council

VOLUME VI

January-February 1956

NUMBER 1

## The Earth Satellite Program

JOSEPH KAPLAN, *Chairman* and HUGH ODISHAW, *Executive Secretary*  
*United States National Committee, International Geophysical Year*

UNITED STATES scientists, under the aegis of the National Academy of Sciences, are now at work on earth satellite vehicles for geophysical research. The launching of earth satellites is one of the many ways in which the United States will participate in the International Geophysical Year, a worldwide program to be carried out between July 1957 and December 1958. During this period, the scientists of more than forty nations will join in the most comprehensive study of the earth ever undertaken. Investigation of the earth's interior, its land and sea surfaces, and its atmosphere, will be carried on simultaneously all over the world.

The earth satellite program is expected to contribute significantly to our understanding of the upper atmosphere, the sun, and the interplanetary medium. Most of our knowledge in these areas is based on indirect observations; only rockets and satellites can provide direct measurements. Rockets are short-lived and restricted in area coverage; satellites are expected to remain in their orbits for weeks or even months, and their repeated revolutions about the earth will give extended area coverage. Thus satellites open a new chapter in man's exploration of his physical environment. They will permit him to observe directly those particles and radiations which are absorbed or reflected by the

atmosphere before reaching the surface of the earth or the lower altitudes within reach of balloons.

The satellite probably will be spherical and between 20 and 30 inches in diameter. The early satellites will weigh a little over 20 pounds. The satellite will be established in its orbit by a three-stage rocket assembly. The first rocket will start the entire assembly vertically on the first part of its flight. When its fuel is exhausted, the second rocket will continue to propel the satellite upward, but at an angle from the vertical. The third rocket will direct the satellite into its orbit at a speed of about 18,000 miles per hour.

The orbit will be in the shape of an ellipse, with the satellite passing within about 200 miles of the earth's surface at the nearest point and reaching a distance of about 800 miles at the farthest. The orbit will be an intermediate one, at least for the initial satellites, inclined more toward the Equator than the Poles. Current plans call for use of the Patrick Air Force Base in Florida where appropriate rocket range facilities exist for launching satellites.

At a speed of 18,000 miles an hour, the satellite will complete a trip around the earth about every hour and a half; it will pass from horizon to horizon, as one stands at a point directly beneath its course, in about 9 to 18 minutes, depending on its

altitude at the time. It will eventually be slowed down by the resistance of the very rarefied atmosphere encountered even at such high altitudes and, as it loses speed, it will gradually come closer to the earth. As it enters the dense atmosphere at lower levels, friction will cause it to heat and finally to disintegrate much like a meteor.

The satellite will have a reflective surface and will be just visible to the naked eye in clear weather at dawn and dusk, when the sun's rays illuminate it against the background of a darkened sky. It will be readily observable under good atmospheric conditions by means of binoculars and wide-field optical equipment. It will be tracked, by both optical and radio means, from a number of ground stations.

The satellite will be equipped with instruments for making scientific observations. In addition, it will carry a telemetering transmitter for sending instrument readings to ground receivers, a control receiver and timing mechanism for turning equipment on and off, and an energy supply.

There are, of course, many types of experiments which scientists would like to conduct with the aid of the satellite. Some of these demand careful observations of the satellite as it circles the earth in its orbit, while others require special instrumentation inside the satellite itself. Unfortunately, the limited size of the air-borne laboratory will restrict the number of experiments of the latter type. At the present stage in planning the National Committee contemplates a variety of observations. Some examples of the kind of information which can be obtained from these observations are enumerated below:

- 1) The density of the outer atmosphere can be determined by observing the perturbations in the orbit of the satellite due to atmospheric resistance.
- 2) Carefully synchronized observations from different points on the earth's surface will permit a much more accurate measurement of the distances between the continents than has heretofore been possible.
- 3) More accurate data on the shape of the earth, and in particular on its oblateness,

can be obtained by measurements of the orbit.

- 4) It is possible that an observable perturbation in the orbit will be caused by non-uniform distribution of mass in the earth's crust and, if this happens, scientists will obtain a clearer picture of the composition of the crust.
- 5) By installing photon counters in the satellite, the radiation of the sun in the ultraviolet and X-ray portions of the spectrum can be determined. Since these radiations are largely absorbed by the earth's atmosphere, such observations cannot be made effectively from the earth's surface.
- 6) Since cosmic rays are partially absorbed by the atmosphere and are deflected as well by the lines of force of the earth's magnetic field, the use of Geiger counters in the satellite to measure cosmic rays should provide valuable new knowledge.
- 7) Instruments could be placed in the satellite to measure the contents of outer space, in particular to determine the density in space of hydrogen atoms and ions, and to measure the impact of the meteorite particles which constantly enter the atmosphere.
- 8) Finally, measurements of the earth's magnetic field and the Störmer current ring can be made with appropriate magnetic and electric measuring devices.

Shortly after President Eisenhower's announcement that the United States would launch an earth satellite during the International Geophysical Year, a technical panel on the satellite program was formally established with functions corresponding to those of the other panels of the United States National Committee (*see News Report*, Vol. V, No. 6, p. 97). This panel, with such additional membership and consultants as are necessary, will have fundamental responsibilities for further developing, coordinating, and directing the overall scientific satellite effort on behalf of the National Committee.

As in all other parts of the program for United States participation in the International Geophysical Year, the National Science Foundation has cooperated with

the National Committee on the earth satellite endeavor by assisting in securing Government support and participation. Of particular importance is the part played by the U. S. Department of Defense, which is making substantial and indispensable contribution to two other programs of the National Committee (those having to do with the Antarctic and with high-altitude rocket observations) and which is providing the facilities and experienced personnel without which a satellite launching could not be realistically or economically attempted. The National Committee's proposal of May 6, 1955, to the Government with regard to the satellite undertaking recognized the need for such assistance and called for logistical and operational support, the design and construction of propulsion units, and the provision of launching facilities and technical personnel.

Participation in the satellite program by the Department of Defense is being accomplished under the code name Project VANGUARD as a joint Army-Navy-Air Force program under Navy management. A group has been established under the direction of John P. Hagen of the Naval Research Laboratory to carry out the Department's responsibilities.

It is expected that a number of universities, observatories, and other non-governmental organizations will participate in the satellite program by proposing experiments and observations for which the satellite could be used, by locating it and keeping it under observation during its flight, and

by analyzing and interpreting the data obtained.

Once President Eisenhower's approval of the project was announced, it was desirable to begin certain technical phases of the effort immediately so that launchings could be initiated as early as possible during the 1957-58 period of the International Geophysical Year. The group in charge of Project VANGUARD went to work at the Naval Research Laboratory almost immediately, and certain necessary propulsion equipment is already being procured. Several contracts have been awarded for the manufacture of the units which will propel the satellite into its orbit.

In the meantime, work on the scientific and engineering problems involved in providing the satellite with proper instrumentation and in observing it is being carried on by the National Academy of Sciences through the United States National Committee, its earth satellite panel, and the cooperating scientists in private as well as public institutions.

The satellite will be observable by the scientists of many nations, who will be able to gather data by tracking the object's course through the skies. In addition, its design and instrumentation will be made known. After the satellite's flight, the results of observations will be published. Thus it will constitute a research instrument for the scientists of every nation and enhance substantially the value of scientific data gained through the other programs of the International Geophysical Year.

## SCIENCE NEWS

### COMMITTEE FOR SYSTEMS EVALUATION GROUP

Under the terms of an agreement with the U. S. Department of Defense, the Academy-Research Council has been furnishing services of a supplementary nature to the Weapons Systems Evaluation Group in the Office of the Joint Chiefs of Staff. With the transfer of the Group from civil

service to a private corporation newly formed by the Massachusetts Institute of Technology in association with several other universities, the Academy-Research Council has concluded its responsibility, and the advisory committee under the chairmanship of E. Bright Wilson, Jr., of Harvard University has been discharged with thanks.

## COMMITTEE ON BIOLOGICAL CHEMISTRY

For some time biochemists have been concerned about the quality of commercial biochemical products and have felt that investigators were unsuspectingly using materials of dubious quality. Therefore, at the 1955 spring meeting of the Division of Biological Chemistry of the American Chemical Society and the American Society of Biological Chemists, the governing bodies of the two organizations recommended that the problems of quality of biochemicals be referred to the Committee on Biological Chemistry of the Academy-Research Council for investigation.

In May the Committee began its work by mailing questionnaires to all members of the two biochemical groups mentioned above. From the large response, it was evident that there was a serious need to improve the quality of biochemicals and that a committee representative of academic research and industry should be responsible for bettering the situation.

In November the Committee met again to evaluate the returns from the questionnaire and to decide what positive steps could be taken. Realizing that the establishment of minimum standard specifications for biochemicals, possibly supplemented with reference substances, was a task of such magnitude that it would require a long time and provide little immediate benefit, the Committee on Biological Chemistry decided to draw up description sheets for biochemicals covering the physical constants, methods of preparation, methods of purification and assay, likely impurities and their methods of determination, information concerning stability and storage conditions, and a list of suppliers. The sheets will be distributed in such a form that biochemists can obtain them at nominal cost.

The task of drawing up the description sheets was assigned to various subcommittees representing specialized areas of biochemistry. Because the questionnaire revealed the greatest need for information on nucleic acids, amino acids, and nucleotide coenzymes, the subcommittees for these fields were set up first. It is anticipated that subcommittees will also be

formed for enzymes, lipids, carbohydrates, and other fields.

The present membership of the Committee on Biological Chemistry, under whose direction the various subcommittees are conducting their investigations, is as follows:

H. E. CARTER, Noyes Laboratory, University of Illinois, *Chairman*

JOHN T. EDSELL, Biological Laboratory, Harvard University

SIDNEY WEINHOUSE, Institute for Cancer Research  
HANS NEURATH, University of Washington

OTTO SCHALES, Alton Ochsner Medical Foundation

C. V. SMYTHE, Rohm and Haas Company

Further suggestions are welcomed by the Committee and may be addressed to the Committee on Biological Chemistry, Academy-Research Council, 2101 Constitution Avenue, Washington 25, D. C.

## INTERNATIONAL SCIENTIFIC RADIO UNION

The semiannual meeting of the United States National Committee of the International Scientific Radio Union (URSI) was held at Gainesville, Fla., December 15-17, 1955, at the College of Engineering of the University of Florida. Local arrangements were made by J. Weil and A. W. Sullivan, both members of the University faculty. H. W. Wells of the Carnegie Institution of Washington, who is chairman of the National Committee, led the discussions of administrative and organizational aspects of United States participation in URSI.

In addition to several technical sessions organized by the various commission chairmen, the National Committee and the Arrangements Committee under the chairmanship of J. H. Dellinger, Honorary President of URSI, mapped plans for the 12th General Assembly of URSI to be held in Boulder, Colo., August 22-September 5, 1957. Preliminary announcements of the Boulder meeting have already been circulated. Additional copies may be obtained from URSI 1957 General Arrangements Committee, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D. C.



#### SCIENTISTS APPOINTED TO UNITED STATES IGY PROGRAM

Detlev W. Bronk, President of the National Academy of Sciences, and Joseph Kaplan, Chairman of the U. S. National Committee for the International Geophysical Year (IGY), recently announced the following three appointments: Edward O. Hulburt, retiring director of research at the U. S. Naval Research Laboratory, has been appointed Senior Scientist for the United States program for the IGY; Harry Wexler, director of meteorological research at the U. S. Weather Bureau, has been appointed Chief Scientist for the United States IGY Antarctic program; and Albert P. Crary, of the Air Force Cambridge Research Center, has been appointed Chief Scientist of the United States Antarctic Glaciology program and Deputy Chief Scientist of the overall Antarctic program.

Dr. Hulburt will work closely with the many scientists and institutions involved in the United States program for the IGY and will serve as advisor to the U. S. National Committee. He has had long experience in geophysical research. From 1924 to 1949, he was superintendent of the optics division at the U. S. Naval Research Laboratory and since 1949 has been director of research. He led the solar eclipse expeditions to the Sudan in 1952 and to Sweden in 1954 and was a member of the solar eclipse expeditions to Brazil in 1940 and 1947. Dr. Hulburt received the Distinguished Civilian Service Award from the Secretary of the Navy in 1945 and the Ives Medal of the Optical Society of America in 1955.

As Chief Scientist for the United States Antarctic program, Dr. Wexler will be responsible for carrying out the scientific program of geophysical research to be undertaken by American scientists on the Antarctic continent in 1957 and 1958. He was a pioneer in the study of the upper atmosphere, cold waves, and hurricanes. In 1944 he made the first penetration by aircraft of an Atlantic hurricane, for which he received the Air Medal. During World War II he was a meteorology instructor in the U. S. Air Force and later became director of meteorological research.

Mr. Crary will be in charge of studies of seismology and gravity as well as glaciology and will supervise the scientific aspects of the over-snow traverses conducted by the expeditions during 1957 and 1958. He has spent most of the past four years in the Arctic. In 1952 he helped establish the first weather station base on T-3, an ice island then only 70 miles from the North Pole. He returned to T-3 in 1953 and 1955 to continue his seismological and oceanographic observations and studies of sea and island ice. He made similar investigations on Ellesmere Island during a joint Canadian-United States expedition in 1954. Since 1949 Mr. Crary has been a research scientist in geophysics at the Air Force Cambridge Research Center.

#### LECTURE BY W. F. ALBRIGHT

The second in the current series of Academy-Research Council afternoon lectures was given on November 20, 1955, by Professor W. F. Albright who spoke on the subject of the "Dead Sea Scrolls," religious documents from the first century B. C. discovered in a cave near the Dead Sea in 1947. Dr. Albright, a member of the Academy and professor of Semitic languages at the Johns Hopkins University, described the scrolls as the most fantastic discovery ever made in Palestinian archaeology. Palestine's soil and climate do not lend themselves to the preservation of manuscripts. But the so-called Dead Sea Scrolls, written on sheepskins sewed into long strips, were rolled and wrapped in linen, sealed in clay jars, and hidden in caves, where they remained remarkably well preserved for 1,900 years.

Professor Albright was the first authority to state categorically that the scrolls were significant and genuine, a judgment based on photographs of the text. That this was possible is due largely to Professor Albright's distinguished work in what might be called the taxonomy of artifacts and scripts. He explained that every human endeavor evolves with time and changes form, as a result of which, styles in pottery, architecture, and even alphabets can be correlated in such a way that the relative

dates of samples can be determined with confidence. The technique is analogous to stratigraphic correlation and paleontology in the earth sciences. Professor Albright recognized at once that the script in which the scrolls were written was a well-known Jewish-Aramaic form, but older than any examples previously known, probably dating from about 100 B. C. The scrolls were obviously old when hidden, being patched in many places. Radiocarbon dating methods using the linen in which the scrolls were wrapped placed the date of hiding at A. D. 33, but with a margin of error of 200 years plus or minus. Current work with improved techniques will probably narrow this margin considerably. Roman coins and local history suggest that the scrolls were hidden during a war in A.D. 68.

Regarding the origin and significance of the scrolls, Professor Albright stated that there can be no doubt but that they are Essene writings. Thus they shed light on this least known of the three principal Jewish sects of the period, the Pharisees, the Sadducees, and the Essenes. He rejected the hypothesis that the writings are actually "Christian" but preceding Christ. However the scrolls fill a gap in our knowledge of an important period immediately preceding Christ and provide a clearer picture than has been available before of the intellectual soil in which the ideas of Christianity took root. Many ideas which heretofore had been encountered no earlier than the first or second century A. D., are now known to be much older. Thus many deductions regarding the New Testament literature, such as the date of writing of the books and the identification of supposed later interpolations may have to be completely revised.

He said that the work of dozens of scholars for decades will be necessary in order to sift the fragments of manuscript that have been found, to correlate texts, and to re-analyze other documents in the light of new evidence. Only in this way can a *consensus eruditorum* be reached among scholars in the field of research in antiquities corresponding to the consensus reached on the basis of independent research in the natural sciences.

#### SCIENTISTS AND MOBILIZATION RECENT DEVELOPMENTS

Three Executive Orders of great potential significance to science and technology were issued in January by President Eisenhower. On January 6 Executive Orders No. 10650 and No. 10651 were released by the White House, and on January 16 the Office of Defense Mobilization released a list of occupations and activities which would serve as the basis for selecting persons subject to the provisions of the other two Executive Orders.

The first of these Executive Orders, No. 10650, was issued pursuant to the provisions of the Reserve Forces Act of 1955, as well as the earlier legislation to which it is related. This order provides the procedures by which Local Selective Service Boards may authorize the enlistment of individuals, who possess critical skills, for a short period of three to six months, after which they will be remanded to the Ready Reserve. They will remain in the Ready Reserve or be transferred to the Standby Reserve to discharge the remainder of their military liability, excepting in the case of all-out mobilization. In that case they will be subject to Selective Service screening.

The second Executive Order, No. 10651, provides for the screening of the Ready Reserve in the case of persons possessing critical skills. According to this Executive Order such persons shall be discharged from the Ready Reserve into the Standby Reserve, provided they are in excess of the requirements of the Ready Reserve for persons of their particular skills and provided they do not possess an overriding military specialty.

The third Executive Order provides the list of critical activities and occupations which are used in carrying out the provisions of the previous two orders. Practically all branches of the physical sciences are included in the list of critical occupations, as well as most teachers at college and high school level in these areas. The biological sciences are only included in respect to pharmacology, parasitology, microbiology, and physiology.

In many of these fields a minimum of one year of education or training beyond the



bachelor's degree is required. Among the activities included as bases for such transfers are those in research and development programs.

What this means in general is that, in the fields of science listed, an individual who fails to be further deferred by his Local Board, or who does not wish to be considered for further deferment and consequently is placed in a 1-A category, may request the opportunity to enlist for this special short-term training followed by Reserve assignment. Such cases must be referred to Advisory Committees in each state, set up for the purpose, which will then advise the Local Board as to proper disposition of the cases. If the individual is permitted to enlist for such training, it is very probable that his stay in the Ready Reserve will be very short, since the requirements of the Ready Reserve for personnel of this kind are in general negligible. Thereafter the individual is no longer subject to training requirements and can be inducted into the services only in case of all-out mobilization after occupational screening by the Selective Service System.

#### PROFESSIONAL PERSONNEL NEEDED FOR UNITED STATES ANTARCTIC PROGRAM

The United States National Committee for the International Geophysical Year announces that research positions are available for scientists, engineers, and technicians to participate in the U. S. Antarctic program planned by the Committee as part of the International Geophysical Year, 1957-58. The U. S. Antarctic program emphasizes the following fields: aurora and airglow, cosmic rays, geomagnetism, glaciology, gravity, ionospheric physics, meteorology, and seismology. Major geophysical research stations will be established at Little America, Marie Byrd Land, the South Geographic Pole, on the Knox Coast, and along the Weddell Sea.

The scientific program will cover slightly over two years from January 1956 to April 1959. Scientists and technicians will leave United States about November 1, 1956. Positions are open for either the full period of investigations or for the two periods, November 1956-April 1958 and November

1957-April 1959. Approximately two months of advance training will be provided in problems of research, instrumentation, and operations in the polar regions.

Applicants with training in physics, geophysics, electronics, or closely allied areas and interests in the fields of investigation listed above will be eligible for consideration. Positions are available at the bachelors', masters', and doctorate levels of training and experience. Additional information on the positions available and the requirements may be obtained from the United States National Committee for the International Geophysical Year, National Academy of Sciences, 2101 Constitution Avenue, Washington 25, D. C. Applications for the first period, November 1956-April 1958, must be postmarked no later than May 1, 1956. Applications for the second period, November 1957-April 1959, may be filed up to May 1, 1957.

#### CONFERENCE ON PLATELETS

The study of blood platelets has attracted increasing attention of late because of their importance in the pathogenesis of radiation sickness as well as in thrombus formation and hemostasis. Believing that the time was ripe for an exchange of data and ideas between investigators in this field, the Panel on Blood Coagulation and the Subcommittee on Blood and Related Problems held a 2-day Conference on Platelets at the Academy-Research Council Building on November 18 and 19, 1955. The Conference was supported by the military services and Scott N. Swisher and Kenneth M. Brinkhous served as Co-chairmen.

The 21 papers presented covered a broad spectrum of studies ranging from fundamental problems of the origin, morphology, biochemistry, physiology, and immunology of platelets, through technical aspects of enumeration, isolation, preservation, and administration, to clinical studies on the etiology and management of thrombocytopenic conditions. The lively discussions generated by these presentations indicated that the session was a profitable and stimulating one. The proceedings will be made available in mimeographed form to investigators in this field.

## **BUILDING RESEARCH STUDIES FOR FEDERAL HOUSING ADMINISTRATION**

At the request of the Federal Housing Administration (FHA) the Building Research Advisory Board (BRAB) is conducting a series of studies on problems of building construction. These studies will form the basis for possible revision of Minimum Property Requirements by the Architectural Standards Division of FHA.

Each study is being made by a special advisory committee of BRAB, appointed by the Academy-Research Council after BRAB has canvassed the various technical and professional bodies, research organizations, industries (including trade associations and manufacturers), and other bodies, to locate the authorities on the subjects to be studied. The members of each advisory committee are selected with the aim of achieving impartiality in the expression of their joint opinions.

Committees are held to a workable size of 12 to 18 members and the chairmen are, whenever possible, members or former members of BRAB who are thoroughly familiar with the policies and procedures of the Academy-Research Council. The subjects currently being studied by advisory committees are:

1) Slab-on-ground construction for residences; 2) wood block flooring; 3) hot water heaters; 4) vapor barrier materials; 5) the anchorage of frames; 6) termite protection; 7) concrete masonry wall construction, and 8) automatic washing machines and septic tanks.

## **INTERNATIONAL UNION OF PHYSIOLOGICAL SCIENCES**

At the request of three societies in the fields of physiology and pharmacology, the Academy-Research Council is adhering to the International Union of Physiological Sciences (IUPS) on behalf of the United States. Since its organization in 1952, the Union has been admitted to membership in both the International Council of Scientific Unions (ICSU) and the Council of International Organizations of Medical Sciences (CIOMS)—the first union to hold this dual status. It is the 11th union in ICSU to which the Academy-Research

Council adheres and the second in CIOMS.

To coordinate the participation of American scientists in the affairs of the Union, the Office of International Relations established the USA National Committee of the International Union of Physiological Sciences with administrative services provided by the Division of Medical Sciences. The members of the Committee and the organizations they represent are as follows:

### **American Physiological Society:**

MAURICE B. VISSCHER, *Chairman*

WALLACE O. FENN

RALPH W. GERARD

### **American Society for Pharmacology and Experimental Therapeutics:**

K. K. CHEN

CARL F. SCHMIDT

MAURICE H. SEEVERS

### **Society of General Physiologists:**

C. LADD PROSSER

H. BURR STEINBACH

### **Academy-Research Council:**

JAMES A. SHANNON

An organizational meeting was held in December, at which the Committee recommended that the World Health Organization augment its interim support of CIOMS, and plans were laid for participation in the 20th International Physiological Congress to be held in Brussels, July 30–August 4, 1956.

## **STAFF CHANGES DIVISION OF MEDICAL SCIENCES**

**Lt. Arthur J. Weiss** has been assigned as liaison officer on the staff of the Division of Medical Sciences by the United States Navy. Before his recall to active duty last year, Dr. Weiss held fellowships in hematology and in poliomyelitis research at Jefferson Medical College and Hospital in Philadelphia. He replaces **Lt. Comdr. Charles D. West**, who has resumed his investigations at the Sloan-Kettering Institute for Medical Research in New York City.

**Leon H. Warren**, Professional Associate in the Division of Medical Sciences since 1951, resigned as of November 30 to accept a position in the Department of Clinical Investigation of Parke, Davis and Company, Detroit. Dr. Warren served as staff officer to the Committee on Medicine and Surgery and a group of associated panels and subcommittees.

## **PRESIDENT APPOINTED CHAIRMAN NATIONAL SCIENCE BOARD**

Alan T. Waterman, Director of the National Science Foundation, has announced the election of President Detlev W. Bronk as Chairman of the National Science Board for a two-year term. Dr. Bronk has been a member of the Board since 1950 and has served as Chairman of its Executive Committee.

## **GEOGRAPHIC RESEARCH PROGRAM**

The program of support for geographic field research in foreign areas initiated by the Academy-Research Council under the sponsorship of the Office of Naval Research has been received by the profession with enthusiasm. The program was first announced on September 15, 1955, and by the time the Screening Committee of the Division of Earth Sciences met in early December to evaluate the proposals, 23 applications had been submitted. Under the chairmanship of J. R. Bochert, University of Minnesota, the Committee selected seven proposals for support. Six additional projects were designated worthy of financial aid in the event alternate proposals could be accommodated or additional funds became available.

The areas of field study selected by the geographers show the diversity of interest that is being promoted: Burgenland, Austria; Concepción, Chile; Tegucigalpa, Honduras; Iceland; Punjab, India; San José, Costa Rica; and Belo Horizonte, Brazil. The topics, which are as varied as the localities, will be the subjects of doctoral dissertations for five of the investigators.

## **ANNUAL MEETING HIGHWAY RESEARCH BOARD**

The thirty-fifth annual meeting of the Highway Research Board, held in Washington January 17-20, was characterized by a larger attendance and a wider representation of participants than any previous meeting. For the first time in its existence the Board was forced to meet outside the Academy-Research Council building.

Research workers from various state highway departments, universities and colleges,

Federal agencies, trade associations, manufacturing companies, highway consulting groups, foundations, and local county and city highway departments presented 200 papers and reports in the course of the 36 technical sessions and numerous committee meetings scheduled by the different departments of the Board. Staff members of 29 universities and colleges were responsible for 54 papers and reports, research workers from 30 state highway departments prepared 66 papers, and the remaining presentations were made by researchers from 41 different organizations. This represents the widest range of participation for any one meeting in the history of the Highway Research Board.

As one of the oldest continuing organizations of the Academy-Research Council, the Highway Research Board serves as a clearinghouse for highway research information and its annual meetings provide an opportunity for scientists and engineers to present their findings to other experts working in the broad field of highway research. The papers read at the technical sessions ranged in subject from design and construction of roads to technical problems in soils and materials, traffic and vehicle operation, night-time vision and sign legibility, and the important economic, psychological, and sociological problems of transportation and modern urban development.

One of the highlights of the meeting was the presentation of awards. This year the Roy W. Crum Distinguished Service Award was conferred upon Earl F. Kelley, Chief of the Physical Research Branch, U. S. Bureau of Public Roads; Tilton E. Shelburne, Director of Research for the Virginia Department of Highways; and Stanton Walker, Director of Engineering for the National Sand and Gravel Association. The Highway Research Board Award for the best technical paper delivered at the previous annual meeting was presented to Carl C. Saal, Highway Transport Research Engineer in the Highway Transportation Research Branch of the U. S. Bureau of Public Roads, for his paper on "Operating Characteristics of a Passenger Car on Selected Routes."

#### ANNOUNCEMENT OF FULBRIGHT COMPETITIONS

The Committee on International Exchange of Persons announces that negotiations for the continuation of the Fulbright program in India have been successfully concluded and that 18 grants are being offered for university lecturing and advanced research for the academic year 1956-57. Several requests have been received from Indian universities for professors in various scientific specializations and a number of awards may be made in this general area. In general, the awards will extend from August 1956 to May 1957. Applications should be postmarked no later than February 20, 1956.

Early in March, the Committee will issue a booklet listing awards for 1957-58 in the following countries: Australia, Burma, India, New Zealand, the Philippines, and possibly Thailand. At the same time the Committee hopes to include the first program of awards for Chile under the Fulbright Act. Applications for this group of awards should be received by April 15, 1956.

Additional information on all opportunities available and application forms may be obtained from the Conference Board of Associated Research Councils, Committee on International Exchange of Persons, 2101 Constitution Avenue, Washington 25, D. C.

#### GOVERNMENT-INDUSTRY RESEARCH COMMITTEE

The Academy-Research Council's Government-Industry Research Committee went out of existence on November 1, 1955. Established in 1954 in response to requests from a number of sources, the Committee explored ways in which the Academy-Research Council might be of assistance in fostering cordial and fruitful relations between industrial and governmental research, especially in the area of applied research. For this purpose the Committee made widely known its readiness to receive suggestions regarding specific fields of research activity in which there appeared to be a need for closer acquaintance and more complete understanding between Government and industry. At the same time the Committee ascertained that wholly effective

relationships already existed in many areas.

After more than a year during which the Committee received no requests for assistance, the members concluded that an active committee on Government-Industry research was unnecessary. In discharging the Committee President Bronk expressed the view that the experience of the Academy-Research Council in this matter showed either that the problem for which the Committee was established did not exist in any critical form or that it was already being handled effectively through other channels.

The Committee had the following membership:

EDGAR C. BAIN, United States Steel Corporation,  
*Chairman*  
ALLEN V. ASTIN, Director of the National Bureau  
of Standards  
D. P. BARNARD, Deputy Assistant Secretary of De-  
fense for Research and Development  
RALPH BOWN, Bell Telephone Laboratories, Inc.  
RALPH CONNOR, Rohm and Haas Company  
HUGH L. DRYDEN, National Advisory Committee  
for Aeronautics  
PAUL D. FOOTE, Gulf Research and Development  
Company  
G. E. HILBERT, Agricultural Research Service,  
U. S. Department of Agriculture  
RANDOLPH MAJOR, Merck and Company, Inc.  
ROY C. NEWTON, Swift and Company  
ALAN T. WATERMAN, National Science Foundation

#### LECTURE BY EDWARD M. PURCELL

On Tuesday, December 13, Edward M. Purcell, a member of the Academy and professor of physics at Harvard University, delivered the third lecture in the 1955-56 Academy-Research Council series. Dr. Purcell chose as his subject "Nuclear Magnetism." In 1945, Felix Bloch of Stanford University and Dr. Purcell independently discovered the phenomenon of nuclear magnetic resonance absorption for which they shared the Nobel prize in physics for 1952.

The existence of nuclear magnetism was first suggested about thirty years ago, by the splitting of certain spectroscopic lines. For some time this was the only nuclear magnetic effect known, a fact which is not surprising when one considers a scale of typical intensities of various types of mag-

netism at room temperature. If ferromagnetic effects are considered unity on such a scale, electronic paramagnetic effects would be about  $10^{-3}$ , diamagnetic effects about  $10^{-6}$ , and nuclear magnetic effects about  $10^{-9}$ . Nuclear magnetism was first measured directly in a Russian experiment in which the nuclear paramagnetic force on solid hydrogen at  $2^{\circ}$  K. was observed.

A system consisting of a proton in a magnetic field can exist in two energy states designated as parallel and anti-parallel. Consequently, the system can emit and absorb "light" of a frequency determined by the energy difference between these two states. For example, this frequency for a proton in a field of 5000 gauss would be about 20 megacycles. The method of determining nuclear magnetic resonance absorption consists in applying a strong, steady magnetic field at right angles to a simultaneously applied alternating electromagnetic field and measuring the absorption or dispersion of the electromagnetic waves as a function of frequency. At a frequency corresponding to the energy difference of the proton states, a sharp increase in energy absorption occurs. This resonance method is a much simpler method of studying nuclear magnetism than direct measurement of the magnetic forces.

The magnetic moments of most stable

nuclei have been measured already and are very well explained by present nuclear theory. The ratios of magnetic moments of nuclei can be measured by this resonance method to 1 part in 10 millions and by subtle refinements of the method the ratio of magnetic moments of a neutron and a proton have been measured.

The National Bureau of Standards has made use of this nuclear magnetic resonance phenomena to determine atomic constants with extreme accuracy and to standardize magnetic field measurements.

Because the local magnetic field near an atom in a molecule is dependent on position in the molecule, the phenomenon of nuclear magnetic resonance can sometimes be used to settle questions of atomic arrangement in molecules. Thus, Andrew and Hyndman were able to settle a question of molecular arrangement in the urea molecule by observing the frequencies of the nuclear resonances.

Nuclear magnetism will probably be used in the future to study the interaction of nuclei and conduction electrons in metals and to measure the nuclear moments of excited nuclei. It is possible that at extremely low temperatures with strong magnetic fields, nuclei could be lined up well enough to study scattering as a function of orientation.

## COOPERATING SOCIETIES

The following schedule of meetings of Societies cooperating with the National Academy of Sciences-National Research Council has been prepared from information supplied by the Societies. For details regarding a specific meeting, please write directly to the Society Secretary.

January		January	
9-10	Operations Research Society of America, <i>Ottawa, Canada</i>	30-Feb. 3	American Physical Society, <i>New York City</i>
9-13	Society of Automotive Engineers, <i>Detroit, Mich.</i>	30-Feb. 3	American Institute of Electrical Engineers, <i>New York City</i>
12	American Genetic Association, <i>Washington, D. C.</i>	30-Feb. 4	American Institute of Physics, <i>New York City</i>
23-25	American Society of Heating and Air-Conditioning Engineers, <i>Cincinnati, Ohio</i>	<b>February</b>	
23-26	American Meteorological Society, <i>New York City</i>	19-23	Society of Economic Geologists, <i>New York City</i>
23-26	Institute of the Aeronautical Sciences, <i>New York City</i>	20-23	American Institute of Mining and Metallurgical Engineers, <i>New York City</i>



<b>February</b>		<b>April</b>	
24-25	American Physical Society, <i>Houston, Tex.</i>	30	American Society for Clinical Investigation, <i>Atlantic City, N. J.</i>
26-29	American Institute of Chemical Engineers, <i>Los Angeles, Calif.</i>	30-May 2	American Geophysical Union, <i>Washington, D. C.</i>
<b>March</b>		30-May 4	American Meteorological Society, <i>Washington, D. C.</i>
	Institute of Mathematical Statistics, <i>Chicago, Ill.</i>	30-May 4	American Psychiatric Association, <i>Chicago</i>
5	Wildlife Society, <i>New Orleans, La.</i>	<b>May</b>	
15-17	American Physical Society, <i>Pittsburgh, Pa.</i>	1-2	Association of American Physicians, <i>Atlantic City, N. J.</i>
18-24	American Congress on Surveying and Mapping, <i>Washington, D.C.</i>	3	Engineering Foundation, <i>New York City</i>
18-24	American Society of Photogrammetry, <i>Washington, D. C.</i>	3-4	Society of Naval Architects and Marine Engineers, <i>Montreal, Canada</i>
19-22	Institute of Radio Engineers, <i>New York City</i>	6-11	Society for Pediatric Research, <i>Buck Hill Falls, Pa.</i>
21-24	American Astronomical Society, <i>Columbus, Ohio</i>	7-11	American Welding Society, <i>Buffalo, N. Y.</i>
<b>April</b>		10-11	Operations Research Society of America, <i>Washington, D. C.</i>
2-5	Association of American Geographers, <i>Montreal, Canada</i>	23-24	American Iron and Steel Institute, <i>New York City</i>
4-6	American Association of Anatomists, <i>Milwaukee, Wis.</i>	<b>June</b>	
5-7	Optical Society of America, <i>New York City</i>		American Society of Ichthyologists and Herpetologists, <i>Higgins Lake, Mich.</i>
8-13	American Chemical Society, <i>Dallas, Tex.</i>		American Society of Mammalogists, <i>Higgins Lake, Mich.</i>
15-18	Industrial Research Institute, <i>White Sulphur Springs, W. Va.</i>	3-6	American Society of Refrigerating Engineers, <i>Cincinnati, Ohio</i>
15-20	American Association of Immunologists, <i>Atlantic City, N. J.</i>	11-15	American Medical Association, <i>Chicago</i>
15-20	American Physiological Society, <i>Atlantic City, N. J.</i>	17-22	American Society for Testing Materials, <i>Atlantic City, N. J.</i>
15-20	American Society of Biological Chemists, <i>Atlantic City, N. J.</i>	18-20	American Neurological Association, <i>Atlantic City, N. J.</i>
15-21	American Society for Experimental Pathology, <i>Atlantic City, N. J.</i>	18-22	American Crystallographic Association, <i>Baltimore, Md.</i>
16-18	American Academy of Pediatrics, <i>Houston, Tex.</i>	18-24	Acoustical Society of America, <i>Cambridge, Mass.</i>
16-20	American College of Physicians, <i>Los Angeles, Calif.</i>	19-21	American Meteorological Society, <i>Seattle, Wash.</i>
16-20	American Institute of Nutrition, <i>Atlantic City, N. J.</i>	19-22	American Dairy Science Association, <i>Storrs, Conn.</i>
20-21	Institute of Mathematical Statistics, <i>Princeton, N. J.</i>	21-23	American Physical Society, <i>Eugene, Ore.</i>
(tentative)		21-23	American Physical Society, <i>New Haven, Conn.</i>
22-26	American Ceramic Society, <i>New York City</i>	25-29	American Institute of Electrical Engineers, <i>San Francisco, Calif.</i>
23-26	American Association of Petroleum Geologists, <i>Chicago</i>	25-29	American Society for Engineering Education, <i>Ames, Iowa</i>
23-26	Society of Economic Paleontologists and Mineralogists, <i>Chicago</i>	<b>July</b>	
26-28	American Association of Pathologists and Bacteriologists, <i>Cincinnati, Ohio</i>	18-21	Society for the Study of Development and Growth, <i>Providence, R. I.</i>
26-28	American Physical Society, <i>Washington, D. C.</i>	<b>August</b>	
27-28	Seismological Society of America, <i>Reno, Nev.</i>		American Astronomical Society, <i>Berkeley, Calif.</i>
29-May 3	Electrochemical Society, <i>San Francisco, Calif.</i>		
29-May 3	Society of American Bacteriologists, <i>Houston, Tex.</i>		



**August**

- 20-21 Poultry Science Association, *Raleigh, N. C.*  
 20-21 Mathematical Association of America, *Seattle, Wash.*  
 20-25 American Mathematical Society, *Seattle, Wash.*  
 20-27 (tentative) Institute of Mathematical Statistics, *Seattle, Wash.*  
 26-30 American Society for Horticultural Science, *Storrs, Conn.*  
 26-30 American Society of Limnology and Oceanography, *Storrs, Conn.*  
 26-30 American Society of Plant Physiologists, *Storrs, Conn.*  
 26-30 American Society of Zoologists, *Storrs, Conn.*  
 26-30 Botanical Society of America, *Storrs, Conn.*  
 26-30 Ecological Society of America, *Storrs, Conn.*  
 29-31 American Meteorological Society, *Boulder, Colo.*  
 30-Sept. 5 American Psychological Association, *Chicago*

**September**

- Econometric Society, *Detroit, Mich.*  
 Genetics Society of America, *Storrs, Conn.*  
 3-6 Mycological Society of America, *Storrs, Conn.*  
 4-7 American Physiological Society, *Rochester, N. Y.*  
 5-7 American Meteorological Society, *Albuquerque, N. Mex.*  
 7-10 Biometric Society, Eastern North American Region, *Detroit, Mich.*  
 16-21 American Chemical Society, *Atlantic City, N. J.*  
 16-22 American Society for Testing Materials, *Los Angeles, Calif.*  
 17-21 Illuminating Engineering Society, *Boston, Mass.*  
 17-21 Instrument Society of America, *New York City*  
 25-28 Institute of Traffic Engineers, *San Francisco, Calif.*  
 25-28 American Roentgen Ray Society, *Los Angeles, Calif.*

**October**

- Society for Industrial and Applied Mathematics, *Place undecided*  
 1-4 American Dental Association, *Atlantic City, N. J.*  
 1-5 American Institute of Electrical Engineers, *Chicago*  
 8-11 American Academy of Pediatrics, *New York City*  
 8-12 American College of Surgeons, *San Francisco, Calif.*  
 8-12 American Society for Metals, *Cleveland, Ohio*  
 8-12 American Welding Society, *Cleveland, Ohio*

**October**

- 14-17 Society of American Foresters, *Memphis, Tenn.*  
 15-18 American Veterinary Medical Association, *San Antonio, Tex.*  
 15-19 American Society of Civil Engineers, *Pittsburgh, Pa.*  
 18-20 Optical Society of America, *Lake Placid Club, Essex County, N. Y.*  
 21-24 American Society for Pharmacology and Experimental Therapeutics, *Louisville, Ky.*  
 29-Nov. 1 American Meteorological Society, *Asheville, N. C.*  
 29-Nov. 1 Society of Exploration Geophysicists, *New Orleans, La.*  
 31-Nov. 3 American Society of Tropical Medicine and Hygiene, *New Orleans*

**November**

- 1-3 Geological Society of America, *Minneapolis, Minn.*  
 1-3 Mineralogical Society of America, *Minneapolis, Minn.*  
 1-3 Paleontological Society, *Minneapolis, Minn.*  
 12-16 American Public Health Association, *Atlantic City, N. J.*  
 12-16 American Society of Agronomy, *Cincinnati, Ohio*  
 12-16 Soil Science Society of America, *Cincinnati, Ohio*  
 14-17 Society of Naval Architects and Marine Engineers, *New York City*  
 23-24 American Society of Animal Production, *Chicago*  
 25-28 American Society of Refrigerating Engineers, *Boston, Mass.*  
 25-30 American Society of Mechanical Engineers, *New York City*  
 30-Dec. 1 (tentative) American Physical Society, *Chicago*

**December**

- Econometric Society, *Cleveland, Ohio*  
 Society of Vertebrate Paleontology, *New York City*  
 6-9 American Phytopathological Society, *Cincinnati, Ohio*  
 9-12 American Institute of Chemical Engineers, *Boston, Mass.*  
 26-30 (tentative) American Physical Society, *Monterey, Calif.*  
 27-29 American Mathematical Society, *Rochester, N. Y.*  
 27-30 Entomological Society of America, *New York City*  
 27-30 Society of Systematic Zoology, *Atlanta, Ga.*  
 28-30 American Anthropological Association, *Santa Monica, Calif.*  
 29 Mathematical Association of America, *Rochester, N. Y.*

## RECORD OF MEETINGS

### November

- 1 Subcommittee on Infectious Disease and Chemotherapy
- 2 Subcommittee on Dietary Carcinogenesis, *Bethesda, Md.*
- 2-4 National Academy of Sciences, Autumn Meeting, *Pasadena, Calif.*
- 3 Committee on Amino Acids  
Food and Nutrition Board, Executive Committee  
Food Protection Committee, Industry Committee of Liaison Panel  
Special Committee on Natural Resources  
Committee on Foods, Subcommittee on Radiation Sterilization
- 4 Committee on Definitions and Standards of Identity for Foods  
Committee on Milk  
Committee on Nuclear Science  
Food and Nutrition Board
- 4-5 Committee on Biological Chemistry
- 5 Division of Biology and Agriculture, Executive Committee
- 5-6 American Geological Institute, Committee on Glossary of Geologic Terms, *New Orleans, La.*
- 7 Committee on Psychiatry  
American Geological Institute, Standing Committee on Education and Public Relations, *New Orleans, La.*  
American Geological Institute, Standing Committee on Government Relations, *New Orleans*
- 7-8 Advisory Committee on Anchorage of Exterior Walls
- 8 Advisory Committee on Wood-Block Flooring  
Advisory Board on Quartermaster Research and Development, *Chicago*  
American Geological Institute, Standing Committee on Professional Relations and Applications, *New Orleans, La.*  
American Geological Institute, Committee on Finance, Organization, and Program, *New Orleans, La.*
- 9 Materials Advisory Board  
Subcommittee on Stress  
American Geological Institute, Executive Committee, *New Orleans, La.*  
American Geological Institute, Board of Directors, *New Orleans, La.*
- 10 Subcommittee on Food Supply  
Building Research Institute, Board of Governors

### November

- 12 Committee on Preservation of Indigenous Strains of Maize, Executive Committee
- 12-13 Biology Council
- 13-14 Biology Council, Committee on Educational Policies  
Committee on Geography, Advisory to Office of Naval Research  
Committee on Dentistry  
Building Research Institute, Plastics Study Group, *Ann Arbor, Mich.*  
Symposium on Human Engineering, Personnel, and Training Research
- 15 AASHO Road Test, Statistical Panel, *Chicago*
- 16 Maritime Cargo Transportation Conference, Board of Advisors  
Advisory Screening Committee on Fulbright Fellowships in Chemistry
- 16-17 Committee on Surface Drainage of Highways, *Portland, Ore.*
- 17 Panel on Blood Coagulation
- 17-18 Division of Anthropology and Psychology, Committee on Primary Records, *Boston, Mass.*
- 18 Subcommittee on Blood and Related Problems, Executive Session
- 18-19 Second Conference on Platelets
- 19 Advisory Screening Committee on Fulbright Fellowships in Mathematics  
Panel on Transfusion Equipment  
Subcommittee on Dyeing Wool Type Fabrics, *Natick, Mass.*  
Division of Engineering and Industrial Research, Executive Committee
- Pacific Science Board Annual Meeting
- 22 Advisory Screening Committee on Fulbright Fellowships in Engineering and Industrial Research  
Advisory Screening Committee on Fulbright Fellowships in the Physical Sciences
- 26-27 Committee on Animal Nutrition, *Chicago*
- 27 Committee on Animal Health, *Chicago*  
Ad hoc Conference to Review Reports on Recent Survey of Atomic Bomb Casualties Committee
- 28 Committee on Sanitary Engineering and Environment, Subcommittee on Personnel and Training

## November

- 29 Advisory Screening Committee on Fulbright Fellowships in the Medical Sciences  
Institute of Animal Resources, Handbook and Information Committee
- 30 Food Protection Committee, Ad hoc Committee on Surfactants, *Wilmington, Del.*  
Federal Construction Council, Task Group on Selection of Windows

## December

- 1 Highway Research Board, Awards Committee  
Division of Medical Sciences, Executive Committee  
Committee on Medicine and Surgery  
Mine Advisory Committee  
Advisory Board on Quartermaster Research and Development
- 2 Committee on Nuclear Science, Subcommittee on Instruments and Techniques
- 3 Division of Earth Sciences, Executive Committee  
Institute of Animal Resources, Committee on Parasitism, *New York City*
- 2-3 Advisory Screening Committee on Fulbright Fellowships in Biology and Agriculture
- 4 National Academy of Sciences-National Research Council, Governing Board
- 4-6 Committee on Hearing and Bio-Acoustics, *Dayton, Ohio*
- 5 Committee on Ship Steel, Project Advisory Committee SR-141  
Prosthetics Research Board  
Panel on Prosthetics Research and Development
- 6 Panel on High Temperature Alloys  
Subcommittee on Food and Vegetable Products, *Chicago*  
Food Protection Committee, Subcommittee on Toxicology

## December

- 7 Food Protection Committee, Liaison Panel  
Food Protection Committee
- 7-8 Building Research Institute, Conference on Floor-Ceilings and Service Systems in Multi-Story Buildings
- 8-9 Committee on Environmental Protection, Subcommittee on Environmental Research, *Natick, Mass.*
- 9 Committee on Growth, Section on Epidemiology
- 9-10 Committee on Growth, Executive Committee, Panels, and Sections
- 12 Geographic Screening Committee for Foreign Field Research Program  
Subcommittee on Water Supply  
Committee on Sanitary Engineering and Environment
- 13 Chemical-Biological Coordination Center
- 14 USA National Committee, International Union of Physiological Sciences
- 15 Committee on Pioneering Research, Subcommittee on Chemistry of Flavor and Odor, *Natick, Mass.*  
Materials Advisory Board, Panel on Precision Castings  
Committee on International Exchange of Persons
- 17 Division of Mathematics, Nominating Committee, *New York City*
- 19 Committee on Ship Structural Design, Project Advisory Committees SR-127 and SR-140.
- 27 Division of Anthropology and Psychology, Committee on Military Research, *Atlanta, Ga.*
- 28 Biology Council, Subcommittee on College Education, *Atlanta, Ga.*
- 29 Organizing Committee for Conference on Linear Algebras, *Cambridge, Mass.*

## NEW PUBLICATIONS

National Academy of Sciences-National Research Council publications may be ordered through the Publications Office; others may be obtained from the publisher indicated. All publications listed may be seen in the Academy-Research Council Library.

*Abatement of Highway Noise and Fumes, Presented at the Thirty-fourth Annual Meeting, January 11-14, 1955.* Washington, 1955. (National Academy of Sciences-National Research Council. Publication 363. Highway Research Board Bulletin 110.) 47 p., illus. \$0.90.

Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. *Proceedings of the Second Meeting . . . Noise and the Community, 25-26 October 1954.* St. Louis, Mo., 1955. (CHABA Report No. 4.) 32 p. (Available from: Office of Executive Secretary, 818 S. Kingshighway, St. Louis 10, Mo.)

- Bascom, Willard. *A Deep-Water Instrument Station*. Washington, National Research Council, 1955. 7 p. Mimeographed.
- Cole, Jonathan O. *Committee on Problems of Alcohol, a Report of its Activities from 1949 to 1955, the Research Work it Has Supported and the Place of the Work in the Field of Alcoholism*. Washington, National Academy of Sciences-National Research Council, Division of Medical Sciences, 1955. 27 p. Mimeographed.
- Csanyi, Ladis H., and Fung, Hon-Pong. *Upgraded Aggregates in Bituminous Mixes*. Washington, 1955. (National Academy of Sciences-National Research Council. Publication 361. Highway Research Board Bulletin 109.) 49 p., illus. \$0.90.
- Factors Related to Frost Action in Soils, Presented at the Thirty-fourth Annual Meeting, January 11-14, 1955*. Washington, 1955. (National Academy of Sciences-National Research Council. Publication 364. Highway Research Board Bulletin 111.) 110 p., illus. \$2.25.
- Fellowships Administered or Recommended by the National Academy of Sciences, National Research Council . . . 1956-1957*. Washington, [National Research Council, Office of Scientific Personnel, 1955.] 8 p.
- Highway Research Review*. No. 4, Nov. 1955. Washington, National Academy of Sciences-National Research Council, Highway Research Board, 1955. 184 p. \$3.00.
- National Academy of Sciences-National Research Council. Library. *Cooperating Societies, National Academy of Sciences-National Research Council. Revised December 1955. Officers and Meetings*. Washington, 1955. 55 p. Mimeographed.
- National Research Council. Committee on Growth. *Ninth Annual Report to the American Cancer Society, Inc., July 1953-June 1954*. Washington, National Academy of Sciences-National Research Council [1955]. 299 p.
- National Research Council. Conference on Glossary of Terms in Nuclear Science and Technology. *A Glossary of Terms in Nuclear Science and Technology*. New York, American Society of Mechanical Engineers, 1955. 189 p. \$5.00.
- National Research Council. Food Protection Committee. *The Safety of Artificial Sweeteners for Use in Foods*. Washington, National Academy of Sciences-National Research Council, Food and Nutrition Board, 1955. (National Academy of Sciences-National Research Council. Publication 386.) 10 p.
- National Research Council. Highway Research Board. *Proceedings of the Thirty-fourth Annual Meeting, Washington, D. C., January 11-14, 1955*. Washington, 1955. (National Academy of Sciences-National Research Council. Publication 362.) 648 p., illus. \$8.50.
- National Research Council of the National Academy of Sciences. *Organization and Members 1954-1955*. Washington, National Academy of Sciences-National Research Council, 1954. 115 p.
- Postdoctoral Research Associateships 1956-1957 Tenable at Argonne National Laboratory, Lemont, Illinois, National Bureau of Standards, Washington, D. C., Naval Research Laboratory, Washington, D. C., Recommended by National Academy of Sciences-National Research Council*. Washington, [1955]. [3] p.
- Soil and Soil-Aggregate Stabilization, a Symposium Presented at the Thirty-fourth Annual Meeting, January 11-14, 1955*. Washington, 1955. (National Academy of Sciences-National Research Council. Publication 359. Highway Research Board Bulletin 108.) 175 p., illus. \$3.00.
- Spector, William S., ed. *Handbook of Toxicology. Volume I . . . Prepared Under the Direction of the Committee on the Handbook of Biological Data, Division of Biology and Agriculture, National Academy of Sciences-National Research Council*. Wright-Patterson Air Force Base, Ohio, Wright Air Development Center, 1955. (WADC Technical Report 55-16.) 408 p. (Trade edition published by W. B. Saunders Company, Philadelphia. \$7.00.)

### Notice of Academy Meetings

#### NATIONAL ACADEMY OF SCIENCES

Annual Meeting, Washington, D. C., April 23-25, 1956

#### NATIONAL ACADEMY OF SCIENCES—NATIONAL RESEARCH COUNCIL

Governing Board, Washington, D. C., April 22, 1956

Governing Board, Washington, D. C., June 17, 1956

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